

Solve the following System

$$\begin{cases} w + x + y + z = 3 \\ -w + x - 2y + z = -2 \\ 2w + 2x - y + z = 3 \\ 3w + x + y - z = 5 \end{cases}$$

variables	Elimination
2	1
3	3
4	6
5	10
6	15
$n$	$\frac{n(n-1)}{2}$
10	45
77	$\approx 2900$

warm up:  $w+x+y+z=3$ 

$$\begin{cases} w+x+y+z=3 \\ -w+x-2y+z=-2 \end{cases}$$

$$2w+2x-y+z=3$$

$$3w+x+y-z=5$$

$$(2x-y+2z=1) \cdot 2$$

$$4x-5y+3z=-1$$

$$-4x+2y-4z=-2$$

$$-3y-z=-3$$

$$\begin{array}{r} -3 - z = -3 \\ +3 \quad +3 \end{array}$$

$$-z=0$$

$$\boxed{z=0}$$

$$1+1+1=3$$

$$3=3 \checkmark$$

$$w+x+y+z=3$$

$$-w+x-2y+z=-2$$

$$2x-y+2z=1$$

$$-2w+2x-4y+2z=-4$$

$$2w+2x-y+z=3$$

$$4x-5y+3z=-1$$

$$-2w-2x-2y-z=-6$$

$$2w+2x-y+z=3$$

$$-3y=-3$$

$$\boxed{y=1}$$

$$w+1+1=3$$

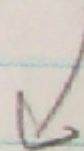
$$\boxed{w=1}$$

$$2x-1=1$$

$$+1 \quad +1$$

$$2x=2$$

$$\boxed{x=1}$$



$$3x - y + z = 3$$

$$x + y + 2z = 4$$

$$x + 2y + z = 4$$

$$3x - \cancel{y} + z = 3$$

$$x + \cancel{y} + 2z = 4$$

$$4x + 3z = 7$$

$$(2) 3x - y + z = 3$$

$$x + 2y + z = 4$$

$$6x - 2\cancel{y} + 2z = 6$$

$$x + 2\cancel{y} + z = 4$$

$$7x + 3z = 10$$

$$4x + 3\cancel{z} = 7$$

$$- \quad 7x + \cancel{3z} = 10$$

$$-3x = -3$$

$$x = 1$$

$$x + y + 2z = 4$$

$$1 + y + 2(1) = 4$$

$$y = 1$$

$$4x + 3z = 7$$

$$4(1) + 3z = 7$$

$$z = 1$$

$$\begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 10 \end{bmatrix}$$

$$A \cdot X = B$$

$$\frac{A}{A} X = \frac{B}{A}$$

$$X = \frac{B}{A}$$

$$\underline{\underline{X = A^{-1} \cdot B}}$$

$$A^{-1} = \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$A^{-1} = \frac{1}{2 \cdot 1 - 1 \cdot 1} \begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 8 \\ 10 \end{bmatrix} = \begin{bmatrix} 2 \cdot 8 + (-1) \cdot 10 \\ -1 \cdot 8 + 1 \cdot 10 \end{bmatrix} = \begin{bmatrix} 6 \\ 2 \end{bmatrix}$$

$A^{-1} \cdot B$

Solve using calculator

$$x + 2y = 10$$

$$3x + 5y = 26$$

$$X = A^{-1} \cdot B$$